

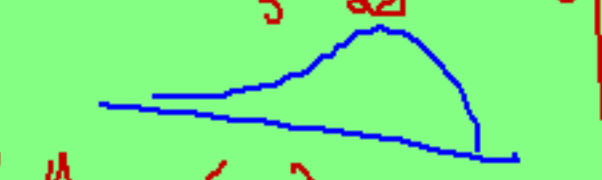
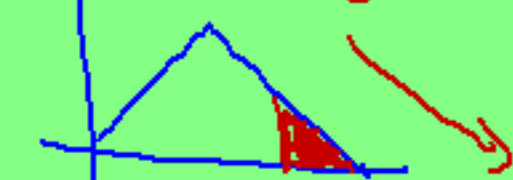
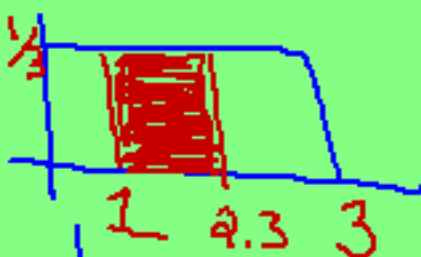
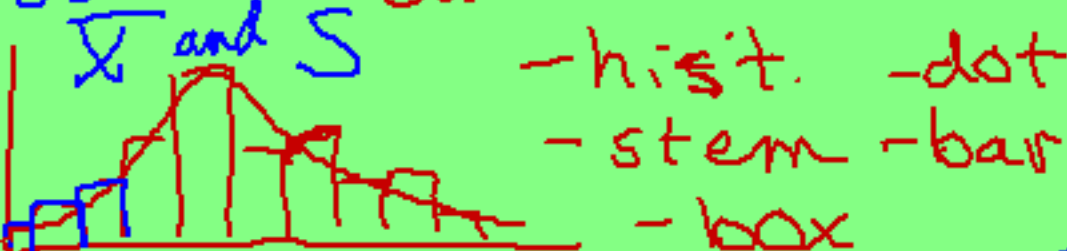
AP STAT: Section 1.3

Other Distributions (using mean and std. deviation)

Histogram/stemplot/etc.

- Sample of data
- actual observations
- diff. forms

Use \bar{x} and s



$$A = (1.3)(\frac{1}{3}) = 0.4333$$

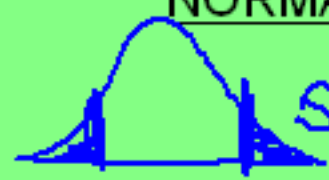
$$N(75, 4)$$

Density Curve

- smooth curve - continuous distr
- population use: μ and σ
- idealized model of the data
- one form \rightarrow diff. shapes
- area under curve = 1 = 100%
- like rel. freq. hist.

Specific Density Curve:

NORMAL CURVE (or DISTRIBUTION)



• symm, unimodal, bell-shaped

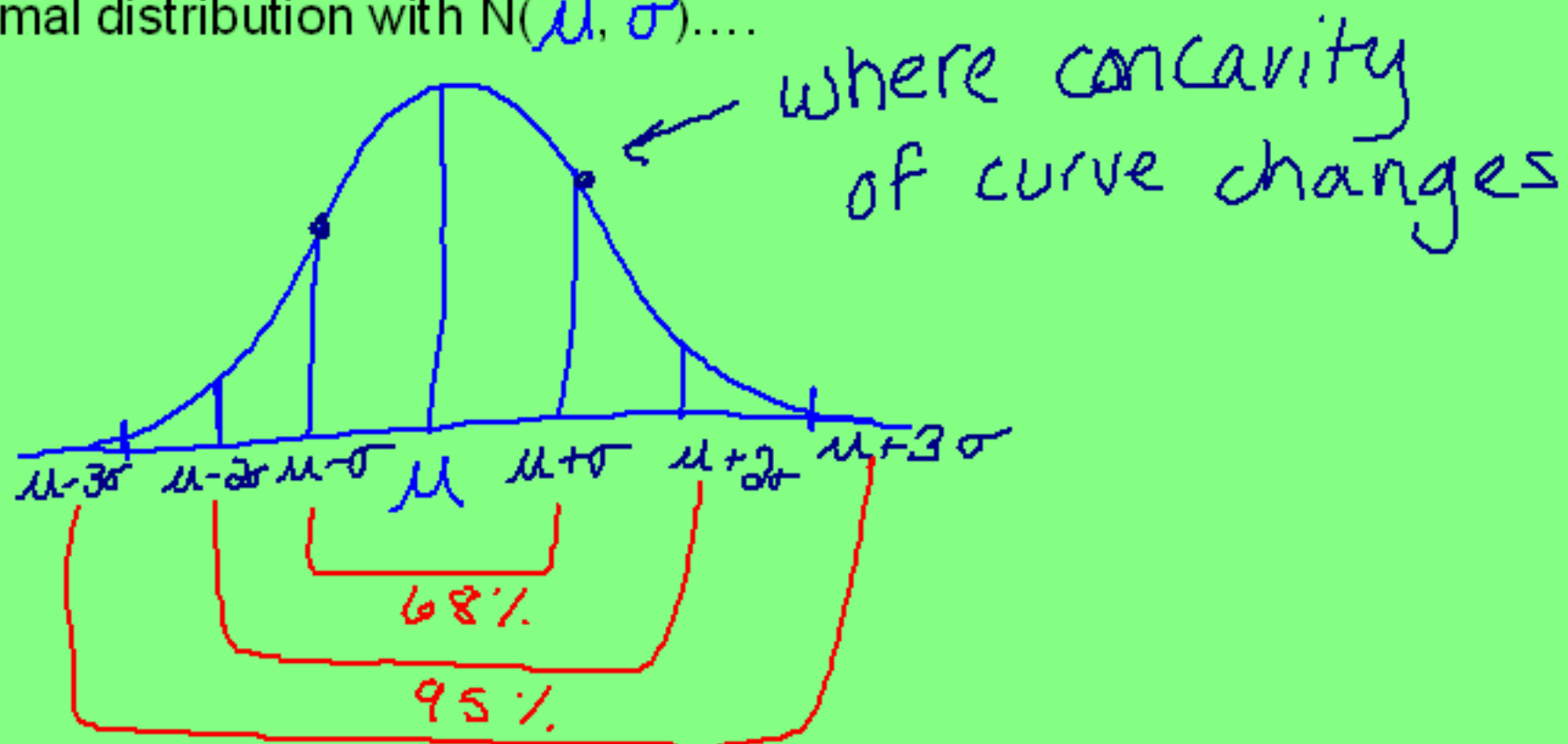
• describe normal data:
Ex: hts, wts, test scores

$$N(\mu, \sigma)$$



Empirical Rule

In a normal distribution with $N(\mu, \sigma)$



- 68 % of the observations fall within $\mu \pm \sigma$
- 95 % of the observations fall within $\mu \pm 2\sigma$
- 99.7 % of the observations fall within $\mu \pm 3\sigma$

Example:

The avg. time that it takes a crew from Sweeper Sam to clean a room is normally distributed with a mean of 2.1 hrs and a standard deviation of 0.3 hrs.

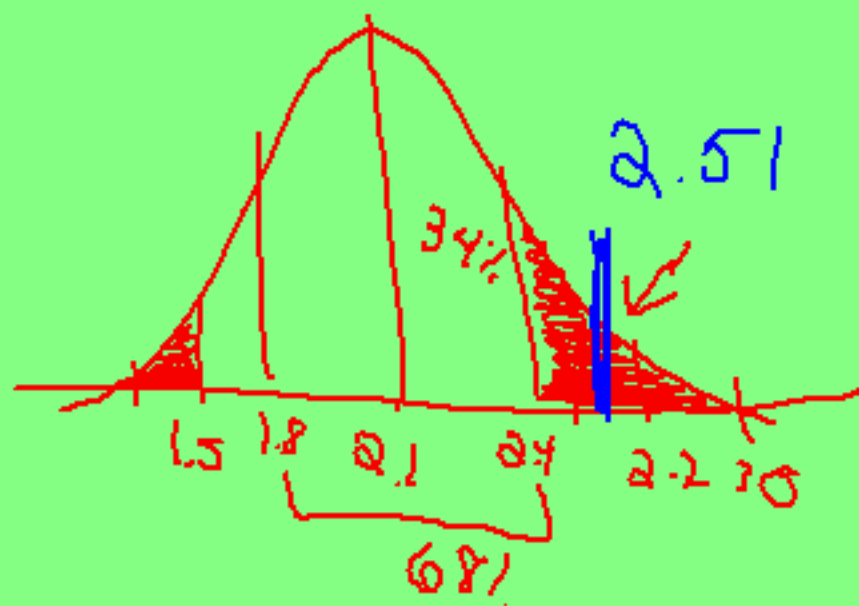
- a) The total clean up time will fall within what interval 95% of the time?

$N(2.1, 0.3)$ $\mu \pm 2\sigma = 2.1 \pm 2(0.3) = (1.5, 2.7)$ $\pm 2\sigma$

- b) What proportion of the time will it take the crew 2.5 hours or more? hrs

16%

- c) What percent of the time will it take the crew 1.5 hrs or less?



Standardizing Observations

- 1) You are in a history class and a math class. You take your chapter 1 test in both classes on the same day, and get them both back a few days later. Your grades are as follows. Which class did you do better in?

History: 81%

Math: 75%

- 2) Same scenario. However, each teacher tells you a bit about how your class did. Which class did you do better in?

Same

History:
mean: 76%

Math:
mean: 70%

- 3) Same scenario. However how your teacher gives you the class standard deviations. Which class did you do better in?



History:
std. dev: 8%

Math:
std. dev: 2.5%



0.70 4.1σ

2σ

Standardizing Observations

Question: How can we compare one distribution to another distribution if they don't have the same parameters (mean and std. dev)?

Answer: compare the observation to its mean and std. dev.

To standardize:

- measure observations.... in terms of how far it is above/below its μ .
- $Z = \text{Z-score} = \frac{\overset{\text{obs.}}{x} - \mu}{\sigma}$
- Z-score tells us... how many σ that obs. is above/below its μ .

$Z = 1.3 =$ the obs. is 1.3 σ above its μ .
-2.1

Example: The heights of 18-24 year old women are normally distributed with the following:

mean = 64.5" and std. dev = 2.5"

$N(64.5, 2.5)$

We know a woman who is 69" tall. How does she compare to the rest of the women in her age group? Calculate her z score, and interpret what it means.

$$z = \frac{x - \mu}{\sigma} = \frac{69 - 64.5}{2.5} = 1.8$$

1.8 σ above her μ .

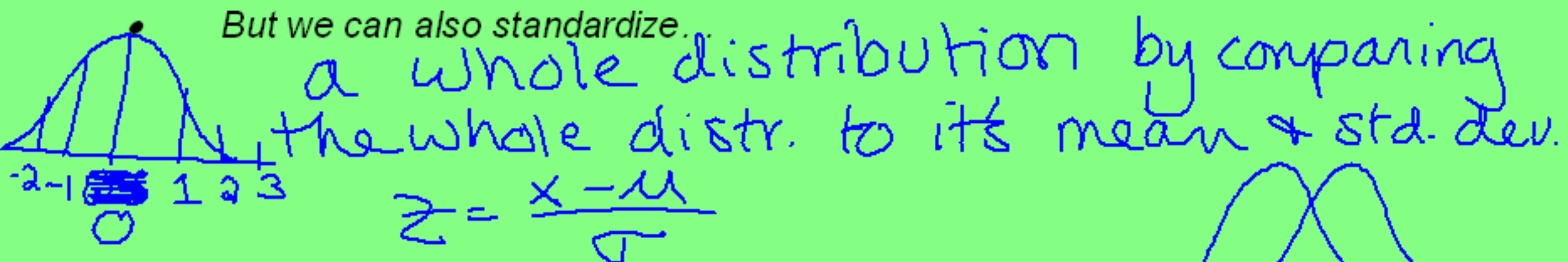
Man: 69" tall

$N(67, 2.1)$

$$z = \frac{69 - 67}{2.1} = 0.95$$

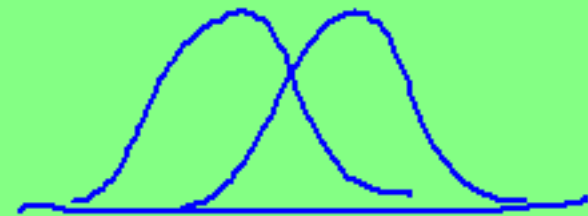
Notes on Standardizing a distribution:

- Standardizing one observation... compare it to its mean



- But what does this do to the shape of the distribution?

doesn't change



- Standardizing is actually just...

~ changing the units
~ manipulating the data

- When we do this we have a new distribution, called: Standard Normal Distrib.

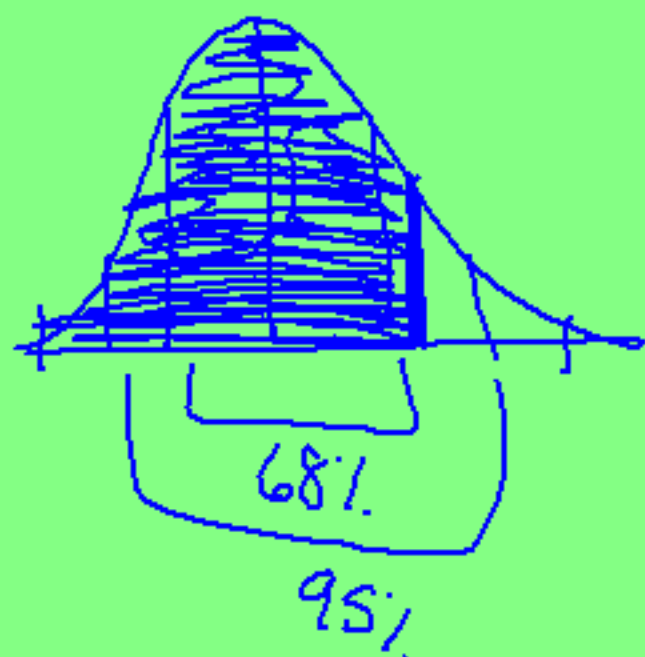
T-2 and T-3

- Table A in the book

$z = 1.3$

- Gives: prob. (% , prop, area) of data below a certain z-score
- So, the area to the left of the z-score represents...

% of the data below
= percentile



$z = 1.34$

Back to the height example....

Remember that the heights of 18-24 year old women are $N(64.5", 2.5")$. What percentile is the girl who is 68" tall?

What percent of 18-24 year old women are less than 5 feet tall?

What percent 18-24 year old of women are over 5'8" tall?

**** PROBABILITY NOTATION!!**

Another example:

Blood pressures of high school students are $N(170, 30)$. What is the probability that a randomly selected high school student has a blood pressure of 180 or above?

Using the same data as above, what is the probability that a high school student has a blood pressure between 160 and 230?

Using the same data as above, what blood pressure has 25% of the observations below it?

Calculator use:

To find the percent of observations between 2 points:

$$\text{normalcdf}(\overset{a}{\text{lower bound}}, \overset{b}{\text{upper bound}}, \mu, \sigma)$$

$$P(a < X < b)$$

To find what observation has a certain percent of the data below it:

$$\text{invnorm}(\text{prop. below}, \mu, \sigma)$$

On the calculator, infinity is: $P(X > 180)$ $P(180 < X \leq \text{inf.})$

$$E99$$

$$-\infty = -E99$$

